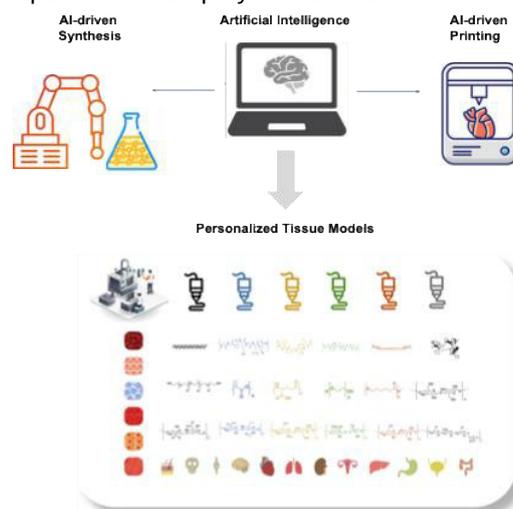


THE ECM-MIMICS REVOLUTION IN TISSUE ENGINEERING: FROM AI-ASSISTED SYNTHESIS TO GLYCOBIOMATERIALS FOR CELL FATE MODULATION

Laura Russo^{1,2,3}

¹University of Milano – Bicocca, School of Medicine and Surgery, Via Follereau 3, Veduggio al Lambro, 20854, Italy, laura.russo@unimib.it; ²Fondazione IRCCS San Gerardo dei Tintori Via Pergolesi 33, Monza, 20900, Italy; ³CURAM Research Ireland Centre for Medical Devices, University of Galway, Galway, H91 W2TY, Ireland

Abstract: The synthesis of biomaterials is fundamental for applications in biomedicine, tissue engineering, and drug delivery. In particular, the extracellular matrix (ECM) and its glycosignature play crucial roles in cell fate induction, including pathogenesis. The design of biomaterials that replicate the structural and biomolecular complexity of ECM, with particular emphasis of glycosignature, enables the creation of in vitro tissue models that replicate functional and structural features of human tissues.¹⁻³ The capacity to generate patient specific in vitro tissue models will allow to identify personalized therapeutic treatments. However, the high number of structural and biochemical variables to define and replicate, require the use of AI and the abandonment of artisanal approaches to fasten the research and limit human errors. Automated manufacturing systems and 3D bioprinting, integrated with Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL), can streamline the synthetic process, defining and tuning the structural and biomolecular properties of the construct, including the highly specific glycosignature, to generate the required personalized in vitro 3D tissue model.^{4,5} This talk will present the development of AI-driven tools for the prediction and the automated synthesis of personalized 3D bioprinted tissue models, highlighting their potential to improve efficiency and predictive capabilities in biopolymer fabrication.



Key words: *extracellular matrix, automated manufacturing, 3D bioprinting, machine learning, tissues*

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